Name:

at1117paper: Complete the Square (v312)

Example

A square's edge length is x feet. A rectangle has a height of x feet and a width of 60 feet. Their combined area, found by adding the square's area and the rectangle's area, is 1309 square feet. What is the value of x?

Example's Solution

$$x^2 + 60x = 1309$$

To complete the square, add $\left(\frac{60}{2}\right)^2 = 900$ to both sides.

$$x^2 + 60x + 900 = 2209$$

Recognize the left side is now a perfect-square trinomial. Factor the left side.

$$(x + 30)^2 = 2209$$

Undo the squaring.

$$x + 30 = \pm\sqrt{2209}$$

$$x + 30 = \pm 47$$

Subtract 30 from both sides.

$$x = -30 \pm 47$$

In this geometric example, we are only concerned about the positive solution. So,

$$x = 17$$

Question 1

A square's edge length is x feet. A rectangle has a height of x feet and a width of 26 feet. The total area, of the square and rectangle, is 315 square feet. What is the value of x?

$$x^2 + 26x = 315$$

$$x^2 + 26x + 169 = 484$$

$$(x + 13)^2 = 484$$

$$x + 13 = \pm 22$$

$$x = 9$$

Question 2

A square's edge length is x feet. A rectangle has a height of x feet and a width of 36 feet. The total area, of the square and rectangle, is 405 square feet. What is the value of x?

$$x^2 + 36x = 405$$
$$x^2 + 36x + 324 = 729$$
$$(x + 18)^2 = 729$$
$$x + 18 = \pm 27$$
$$x = 9$$

Question 3

A square's edge length is x feet. A rectangle has a height of x feet and a width of 40 feet. The total area, of the square and rectangle, is 384 square feet. What is the value of x?

$$x^2 + 40x = 384$$
$$x^2 + 40x + 400 = 784$$
$$(x + 20)^2 = 784$$
$$x + 20 = \pm 28$$
$$x = 8$$